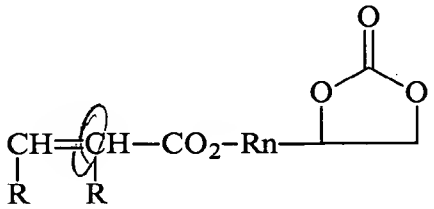
CLAIMS

We claim:

1. A method of making a hydroxyl functional urethanized acrylic graft polymer, comprising

providing an ethylenically unsaturated monomer mixture (a) comprising a monomer (ai) having at least one cyclic carbonate group and the structure



wherein Rn is a straight chain alkane of from 1 to 4 carbons, and R is H or CH_3,

polymerizing the monomer mixture (a) under free radical polymerization conditions to make an acrylic backbone polymer (b) comprising one or more cyclic carbonate functional groups (bi),

providing at least one grafting material (c), said grafting material (c) comprising at least one amine group (ci) selected from primary amines, secondary amines, and mixtures of both primary and secondary amines, and a grafting moiety (cii), and

reacting the at least one amine group (ci) of the grafting material (c) with the cyclic carbonate functional groups (bi) to make a hydroxyl functional urethanized acrylic graft polymer.

2. The method of claim 1 wherein the monomer mixture (a) further comprises one or more additional ethylenically unsaturated monomers (aii) having functional groups which are unreactive with the cyclic carbonate functional groups of monomer (ai) under free radical polymerization conditions.

3. The method of claim 1 wherein monomer mixture (a) further comprises one or more nonfunctional ethylenically unsaturated monomers (aiii).

4. The method of claim 2 wherein the free radical polymerization occurs (1) in temperatures of no more than 180 degrees C, (2) in the absence of epoxy catalysts, and (3) in the absence of catalysts such as Lewis acids and sulphonic acids having a pKa of less than 2.0.

5. The method of claim 2 wherein the one or more ethylenically unsaturated monomers (aii) are selected from the group consisting of hydroxyl functional ethylenically unsaturated monomers, isocyanate functional ethylenically unsaturated monomers, carboxylic acid functional ethylenically unsaturated monomers, urea functional ethylenically unsaturated monomers, carbamate functional ethylenically unsaturated monomers, and mixtures thereof.

6. The method of claim 2 wherein the step of polymerizing monomer mixture (a) makes an acrylic backbone polymer (b) further comprising one or more functional groups (bii) which are unreactive with the cyclic carbonate groups (bi) under free radical polymerization conditions.

7. The method of claim 6 wherein the functional groups (bii) of acrylic backbone polymer (b) are selected from the group consisting of hydroxyl groups, isocyanate groups, epoxy groups, carboxylic acid groups, carbamate groups, urea groups, and mixtures thereof.

8. The method of claim 6 further comprising

reacting the one or more functional groups (bii) with one or more compounds (d) to provide a functional group (bii').

9. The method of claim 8 wherein said reaction between functional groups (bii) and compound (d) occurs before the reaction of the at least one amine group (ci) of the grafting material (c) with the cyclic carbonate functional groups (bi) to make an acrylic graft polymer.

10. The method of claim 1 further comprising reacting the hydroxyl group of the urethanized acrylic graft polymer with one or more compounds (e).

11. The method of claim 1 wherein the at least one amine group (ci) of grafting material (c) is a primary amine and grafting moiety (cii) has six or more carbons.

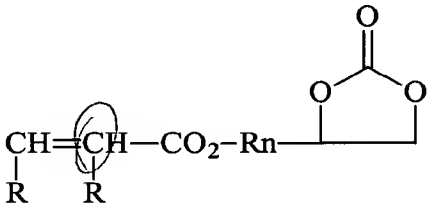
12. The method of claim 1 wherein the at least one amine group (ci) of grafting material (c) is a primary amine and grafting moiety (cii) has additional functional groups.

13. The method of claim 1 wherein the at least one amine group (ci) of grafting material (c) is a primary amine and grafting moiety (cii) has additional functional groups selected from the group consisting of hydroxy, acid, blocked isocyanates, and mixtures thereof.

14. A hydroxyl functional urethanized acrylic graft polymer made by the method of claim 1.

15. A method of making a urethanized acrylic graft polymer, comprising

providing an ethylenically unsaturated monomer mixture (a) comprising a monomer (ai) having at least one cyclic carbonate group and the structure



wherein Rn is a straight chain alkane of from 1 to 4 carbons, and R is H or CH_3, and one or more additional ethylenically unsaturated monomers (aii) having functional groups which are unreactive with the cyclic carbonate functional groups of monomer (ai) under free radical polymerization conditions,

polymerizing the monomer mixture (a) under free radical polymerization conditions to make an acrylic backbone polymer (b) comprising one or more cyclic carbonate functional groups (bi) and one or more functional groups (bii) which are unreactive with the cyclic carbonate groups (bi) under free radical polymerization conditions,

providing at least one grafting material (c), said grafting material (c) comprising at least one amine group (ci) selected from primary amines, secondary amines, and mixtures of both primary and secondary amines, and a grafting moiety (cii) comprising six or more carbons, and

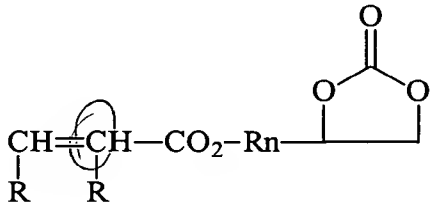
reacting the one or more functional groups (bii) with one or more compounds (d) to provide a functional group (bii'), and

reacting the at least one amine group (ci) of the grafting material (c) with the cyclic carbonate functional groups (bi) to make a urethanized acrylic graft polymer.

16. A urethanized acrylic graft polymer made by the method of claim 15.

17. A method of making a multifunctional urethanized acrylic graft polymer, comprising

providing an ethylenically unsaturated monomer mixture (a) comprising a monomer (ai) having at least one cyclic carbonate group and the structure



wherein Rn is a straight chain alkane of from 1 to 4 carbons, and R is H or CH_3, and one or more additional ethylenically unsaturated monomers (aii) having functional groups

which are unreactive with the cyclic carbonate functional groups of monomer (ai) under free radical polymerization conditions,

polymerizing the monomer mixture (a) under free radical polymerization conditions to make an acrylic backbone polymer (b) comprising one or more cyclic carbonate functional groups (bi) and one or more functional groups (bii) which are unreactive with the cyclic carbonate groups (bi) under free radical polymerization conditions,

providing at least one grafting material (c), said grafting material (c) comprising at least one amine group (ci) selected from primary amines, secondary amines, and mixtures of both primary and secondary amines,

reacting the one or more functional groups (bii) with one or more compounds (d) to provide a functional group (bii'),

reacting the at least one amine group (ci) of the grafting material (c) with the cyclic carbonate functional groups (bi) to make a hydroxyl functional urethanized acrylic graft polymer, and

reacting the hydroxyl group of the urethanized acrylic graft polymer with one or more compounds (e) to provide a multifunctional urethanized acrylic graft polymer.

18. A multifunctional urethanized acrylic graft polymer made by the method of claim 17.